

REMARKS

In response to the Office Action mailed August 14, 2007, Applicant amended claims 1, 6, 7, 9, and 12. No new matter has been added. Claims 1-19 are presented for examination.

Claims 6, 7, and 9 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Although the Applicant does not concede those claims were insufficiently clear, certain amendments have been made to claims 6, 7, and 9. In claims 6 and 7, the expression "as the metal" has been deleted as requested by the Examiner. Claim 9 is now dependent on claim 8. In view of the foregoing amendments, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 6, 7, and 9 under 35 U.S.C. § 112, second paragraph.

Claims 1-19 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. 4,842,038 to Fujino et al. (hereinafter "US '038") and further in view of either UK 2,160,456 (hereinafter "UK '456") and DE 3,635,349 (hereinafter "DE '349").

Both of the independent claims 1 and 12 are now directed, respectively, to a process and apparatus or installation for casting a light metal artefact. Claim 1 is further amended to include heating of the die or mould with an induction heating arrangement which comprises a plurality of at least two induction coils which are operable independently of each other or one another to heat the die or mould while providing the surface of the interior of the die or mould with a desired temperature profile. This feature is already present in claim 12. Both of the independent claims 1 and 12 also specify that the induction coils are spaced from the die or mould.

The Examiner asserts that US '038 substantially show the invention as claimed except that they do not show heating the casting mould, but that UK '456 or DE '359 shows heating the different portions of the casting mould during the casting process to obtain a casting product of better quality, and that it would have been obvious to heat the appropriate portions of the casting mould in the process of US '038 as taught by the secondary references to obtain a casting product of better quality. The Applicant respectfully disagrees.

It is well settled that “the Examiner bears the initial burden of factually supporting any prima facie case of obviousness. If the Examiner does not produce a prima facie case, the Applicant is under no obligation to submit evidence of non-obviousness.” MPEP § 2142. To establish a prima facie case of obviousness, the Examiner must show (1) the prior art reference teaches or suggests all of the claim limitations; (2) some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference; (3) a reasonable expectation of success that such modifications would work. With respect to the motivation to combine the references, the MPEP states “the mere fact that the references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” MPEP § 2413.01. If any one of the three elements is missing, a prima facie case of obviousness cannot be established.

It is well-settled that in order to establish a prima facie case of obviousness, the Examiner bears the burden of showing that every element of the claimed invention is disclosed or suggested by the combination of US ‘038 in view of UK ‘456 or DE ‘349. (See, e.g., MPEP § 2142). This has not been done. For instance, the combination of the cited prior art fails to disclose Applicant’s claimed element of: “at least two induction coils which are spaced from the die or mould and which are operable independently of each other or one another to heat the die or mould while providing the surface of the interior of the die or mould with said desired temperature profile.” The combination of the cited prior art also fails to disclose the Applicant’s claimed element of providing “the surface of the interior of the die or mould with a desired temperature profile whereby the interior surface of the die or mould has different parts or zones at different temperatures from each other or one another, in contact with the molten metal charged into the die or mould, thereby to promote desired cooling and solidification rates in different parts of the metal charged into the die or mould,” or the claimed element of heating the die or mould prior to charging the die or mould with the molten metal.

US ‘038 describes a die casting machine 1 that includes a cylindrical preheater 38 arranged at an outer position in the vicinity of injection sleeves 22 and used to melt the inner

portion of a billet 29. (See, e.g., US '038, col. 3, lines 14-32; see also *id.*, FIGS. 1 and 2 reproduced below). After the inner portion of the billet 29 is melted, the billet 29 is carried into an injection sleeve 22 and is heated by heaters 31. (See, e.g., *id.*, col. 3, lines 32-25). A plunger tip 24 is moved upward to inject the molten metal 33 into cavity 7 formed by movable dies 5 and 6. (See, e.g., *id.*, col. 3, lines 37-39). As acknowledged by the Examiner, US '038 does not disclose or suggest heating the casting mold. (Office Action, p. 2, ¶ 4). Accordingly, US '038 does not disclose or suggest induction heating of the die or mould, as required by claims 1-11, or an induction heating arrangement including at least two induction coils which are spaced apart from the die or mould, as required by claims 12-19.

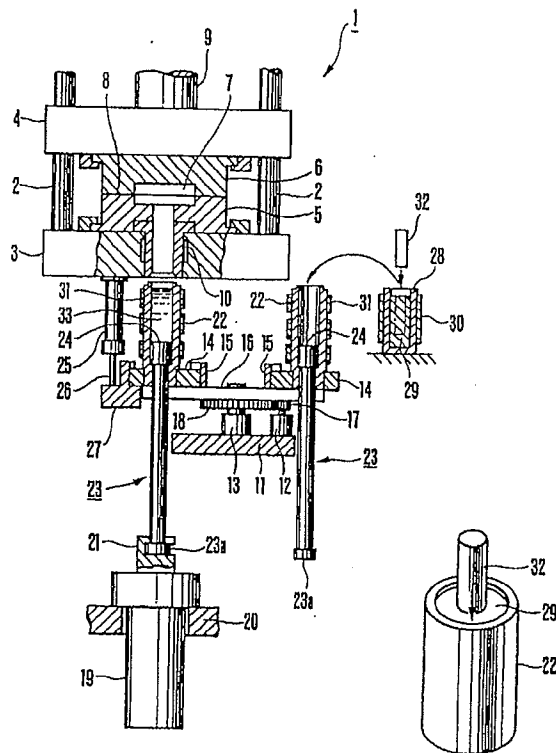


FIG.1

FIG.2

UK '456 does not remedy the deficiencies of US '038 as described above. UK '456 describes a moulding method using half coils 7 inside each half of a mould 8 such that

connection of the two halves of mould 8 forms loops. (See, e.g., p. 2, lines 5-8; see also id., FIG. 3 reproduced below). When the mould 8 is filled with molten metal, an electrical supply to the coils 7 is switched on to heat the arrangement. (See, e.g., p. 2, lines 25-30). The heating electrodes and heating coils are located inside the metal mould 8. There is no teaching or suggestion in UK '456 to use induction coils, nor is there any reference to such coils having to be spaced from the die or mould or any teaching or suggestion that such coils must be operable independently of each other or one another to heat the die or mould while providing the surface of the interior of the die or mould with a desired temperature profile. Instead, UK '456 teaches away from such a concept, by teaching that the heating is applied to the zone at which the excess metal enters the mould containing the cast body 4, and that the heating is applied to the entire body 4 to reduce the cooling rate. (See, e.g., UK '456, page 2, lines 34-38). UK '456 focuses on heating of the metallic material to be cast and on heating of the subsequent cast body in such a manner as to slow the cooling rate from that which would otherwise occur. UK '456 also fails to teach heating of the die or mould prior to casting. (See, e.g., UK '456, page 2, lines 25-41). Thus, UK '456 also does not teach or suggest the desirability of heating the die or mould to provide the surface of the interior of the die or mould with a desired temperature profile, prior to casting.

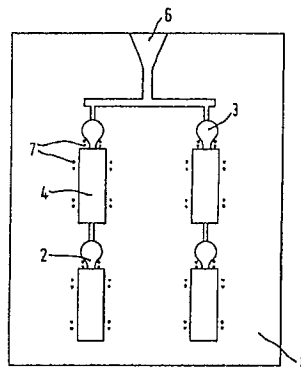
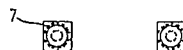
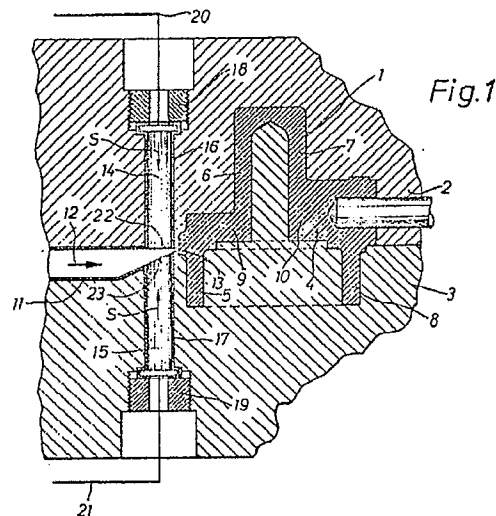


FIG. 3



Similarly DE '349 does not remedy the deficiencies of US '038 as described above. DE '349 describes a device on metal-casting machines for heating the gate and/or die areas of a narrow cross-section. (See, e.g., DE '349, Abstract; see also *id.*, Fig. 1 reproduced below). The device includes electrodes (14, 15) arranged adjacent to a die impression (1) of die halves (2, 3). (See, e.g., *id.*). DE '349 does not teach induction heating of the die or mould prior to charging the die mould with the molten metal, as required by claim 1. DE '349 also fails to disclose a heating arrangement comprising a plurality of at least two induction coils which are spaced from the die or mould and which are operable independently of each other or one another to heat the die or mould while providing the surface of the interior of the die or mould with a desired temperature profile, as required by claim 12. DE '349 instead teaches the use of electrodes (14, 15, 24, 25, 36, 37, 38, 39) which are housed inside the die or mould. DE '349 thus teaches heating of the molten metal, and not the die or mould, with such heating being directed at the molten metal in the inlet gate area (13, 110) of the die or mould or in areas of the die or mould where the volume of the molten metal is small (e.g. 30, 31) compared to other areas inside the die or mould. This heating does not take place prior to charging the die or mould with the molten metal, and is aimed at heating the molten metal and not the die or mould.



Moreover, one of ordinary skill in the art would not have been motivated to consult much less combine the cited secondary references. Claims 1 and 12 are directed to the casting of light metal artefacts. UK '456 is concerned with the casting of ferrous components, such as gray and alloyed iron, nodular iron and in particular steel. UK '456 specifically states "the main difficulties are due to the numerous problems which occur in carrying out solidification of a compound having a high melting point poured into a casting mould." UK '456 also states that "whilst there have been considerable advantages in the field of metals and alloys having a low melting point, considerably less has been achieved with respect to ferrous components, such as gray and alloyed iron, nodular iron and in particular steel." Thus, UK '456 deals with casting of different metals than the light metals of interest in the present invention, and one of skill in the art would not have considered modifying the process of UK '456 in the manner of the present invention. UK '456 clearly teaches that the invention relates to the casting of ferrous components with a high melting point, such as gray and alloyed iron, nodular iron and in particular steel, and that the invention of UK '456 is of no relevance to metals and alloys having a low melting point. To one of skill in the art, there are significant and many differences between the casting of light metal artefacts (i.e. usually having a low melting point of 660°C or less) and high melting point metal compounds, so that a person interested in light metal casting would not consider turning to high melting point metal casting literature for guidance. For example, high melting point metal compounds are usually cast using sand cores as steel cores are typically unable to withstand the thermal shock, whereas low melting point metals, i.e. light metals, are often cast using steel moulds.

DE '349 also does not provide any reason that would have prompted a person of ordinary skill in the relevant field to combine its teachings with those of US '038. In fact, DE '349 deals with high pressure metal casting (80-100 MPa), whereas the present invention is in the field of intermediate pressure casting (typically 50 kPa to 30 MPa), thus steering a person of ordinary skill in the relevant field away from combining the teachings of DE '349 with those of US '038.

Therefore, there is no apparent reason to modify the teachings of US '038 in view of either UK '456 or DE '349.

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Serial No. : 10/596,017
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Page : 15 of 15

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In view of the foregoing, US '039, UK '456, and DE '349, alone or in combination, fail to disclose or suggest each and every limitation of claims 1-19. Therefore, the Applicant requests reconsideration and withdrawal of the rejection of claims 1-19 as being unpatentable over US '039, UK '456, and DE '349.

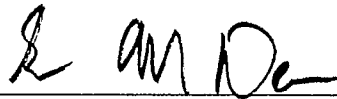
Claims 1-19 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-14 and 17-18 of copending Application No. 10/596,015. The Applicant requests that this rejection be held in abeyance until the claims are otherwise in condition for allowance.

The \$1050 fee for the three-month extension of time is being paid concurrently herewith on the Electronic Filing System (EFS) by way of deposit account authorization. Please apply any other charges or credits to Deposit Account No. 06-1050, referencing Attorney Docket No. 20997-003US1.

Respectfully submitted,

Date:

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